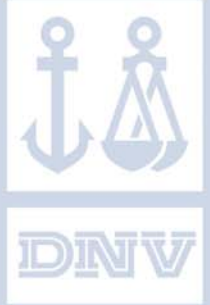


Flux cored wire
high alloyed



Germanischer Lloyd



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High alloyed flux cored wires are an important part of the innovative T-PUT product series. Easy handling in combination with high process robustness has been proven by many users in the field.

Stringent tolerances in manufacturing and chemical composition guarantee a superior product for the diverse welding demands.

With **flux cored wires of the Thermanit TG-series** we achieve the combination of basic rutile stick electrodes benefits with solid wire productivity.

- easy to use
- wide setting range of parameters
- broad arc
- excellent weld profile
- good penetration
- high deposition rate
- high current range
- reduced weld finishing

[V] **Welding in Spray Arc Range**



These resulting properties offer significant benefits to users in form of time and cost savings, which can be substantial depending on the overall situation.

Successful research and product design of these flux cored wires was driven by challenging applications and resulting implications.



Thermanit TG 307

Classification

| EN 12073 | AWSA 5.22 | EN 14700 |
|--------------------------------|-----------|----------|
| T 18 8 Mn RM3 T 18 8 Mn RC3 | E307-T0-G | T Fe10 |

Characteristics and field of use

Thermanit TG 307 is an austenitic CrNiMn flux cored wire with rutile slag characteristic. This rutile flux cored wire operates with a very stable, spatter free arc producing a bright, smooth weld bead surface and self-releasing slag. It is suitable for GMAW welding with mixed gas M21 and C1 (acc. to EN 439) for joining and cladding. Joinings on steels, which are difficult to weld, high manganese steels as well as dissimilar steels (austenite/ferrite) – max. application temperature is 300 °C (572 °F). For large-area cladding/surfacing applications on machine parts, which are work hardened during use, due to impact and pressure affection. Usable for tough stress-compensating buffer layers when hardfacing, filler layers for deep wear stiffening, repair work on rails, crossing frogs, casters, stirring shovels and pump traversing wheels. For repair welding of damages due to cavitation on water turbines and sealing surfaces to fittings (acid mine water). The weld metal is tough, work hardening, wear resistant and heat resistant (resistant to scaling up to 850 °C (1562 °F). Root welding is proved on ceramic backing bar.

Materials

High strength, unalloyed and alloyed steels for quenching and tempering, austenitic manganese steels, corrosion and heat resistant ferritic stainless steels.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Gas |
|-----|-----|-----|------|-----|-----|
| 0,1 | 0,8 | 6,8 | 19,0 | 9,0 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -100 °C | |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------|----|
| AW | M21 | 420 | 450 | 630 | 40 | 70 | 32 |

Hardness approx.: 175 - 225 HB; approx. 400 HB (work hardened)

Structure

Austenite with part ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 and C1,
Consumption: 15 - 18 l/min.

Approvals

upon request

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 140-280 | 23-35 |
| 1,6 | B 300 | 15 | 200-350 | 26-38 |

Thermanit TG 308 L

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|----------------------------|------------------------|--------------|
| T 19 9 LRM3 T 19 9 LRC3 | E308LT0-4 E308LT0-1 | 1.4316 |

Characteristics and field of use

Thermanit TG 308 L is an austenitic CrNi flux cored wire with rutile slag characteristic. It is suited for GMAW welding with mixed gas M21 and CI (acc. to EN 439) on matching and similar, non stabilized and stabilized corrosion resistant CrNi(N) steels/cast steel grades. The weld metal is stainless and provides good resistance to nitric acid, resistance to intercrystalline corrosion – wet corrosion up to 350 °C (662 °F), cold toughness up to -196 °C (-320 °F) and resistance to scaling up to 800 °C (1472 °F). Weldable almost spatter free and due to the very slow freezing rutile slag the weld metals shows very fine and smooth weld pattern. Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle. Root welding is proved on ceramic backing bar.

Materials

X5CrNi18-10 (1.4301), X2CrNi19-11 (1.4306), GX6CrNi18-9 (1.4308), X2CrNi18-10 (1.4311)*, X6CrNiTi18-10 (1.4541), X6CrNiNb18-10 (1.4550), GX5CrNiNb18-9 (1.4552), X6CrNi18-11 (1.4948).
AISI 304, 304L, 304LN, 302, 321, 347;
ASTM A157 Gr. C9; A320 Gr. B8C oder D.

*Material No. 1.4311 certified only with shielding gas M21

Typical analysis in %

| C | Si | Mn | Cr | Ni | Gas |
|------|-----|-----|------|------|-----|
| 0,03 | 0,7 | 1,5 | 19,8 | 10,2 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -196 °C** |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|----------------------------------|
| AW | M21 | 350 | 380 | 560 | 35 | 47 32 |

**only with shielding gas M21 acc. to EN 439

Structure

Austenite with part ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 and CI,
Consumption: 15 - 20 l/min.

Approvals

| | | |
|--|---------------------------------|-----|
| TÜV (Certificate No. 7538) DB (Certificate No. 43.132.15) | Germanischer Lloyd Controlas | UDT |
|--|---------------------------------|-----|

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 0,9 | B 300 | 12,5 | 100-180 | 18-29 |
| 1,2 | B 300 | 15 | 120-280 | 20-30 |
| 1,6 | B 300 | 15 | 180-350 | 22-32 |

Thermanit TG 309 L

Classification

EN 12073

AWS A 5.22

Material No.

T 23 12 LRM3
T 23 12 LRC3

E309LT0-4
E309LT0-1

1.4332

Characteristics and field of use

Thermanit TG 309 L is an austenitic CrNi flux cored wire with rutile slag characteristic. It is suited for GMAW welding with mixed gas M21 and C1 (acc. to EN 439). For joint welding of high-alloyed CrNi(Mo, N) steels/cast steel grades with unalloyed/low alloyed steels (austenite ferrite joints) with a maximum application temperature of 300 °C (572 °F). It is also suited for joint welding of high alloyed CrNi(Mo, N) steels/cast steel grades with stainless and heat-resistant Cr steels/cast steel grades. For intermediate layers when welding the clad side of plates and cast materials clad with non stabilized and stabilized CrNi(Mo, N) austenitic metal. The weld metal is stainless (wet corrosion up to 350 °C / 662 °F). Weldable almost spatter-free and due to the very slow freezing slag the weld metal shows fine and smooth weld pattern. Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle. Root welding is proved on ceramic backing bar.

Materials

Combinations between X10CrNiMoNb18-12 (1.4583), X5CrNi18-10 (1.4301), GX6CrNi18-9 (1.4308), X2CrNiMo17-13-2 (1.4404), X2CrNiMo18-14 (1.4435), X6CrNiTi18-10 (1.4541), GX5CrNiNb18-9 (1.4552), X6CrNiMoTi17-12-2 (1.4571), X6CrNiMoNb17-12-2 (1.4580), X6CrNi18-11 (1.4948), X2CrNiMoN17-13-3 (1.4429), X2CrNi18-10 (1.4311), X2CrNiMoN17-12-2 (1.4406) and ferritic steels P265GH - P295GH, S255N - S355N; shipbuilding steels grade A - E, AH32 - EH36; A40 - F40.

Joining of high strength, mild steel and alloyed temper steel grades, stainless and ferritic Cr-steels and austenitic CrNi steels, austenitic manganese steel, as well as cladding operations: In the first layer (buttering) of chemical resistant cladding of steam and other pressure vessels in ferritic perlitic grades up to S500N, and heat resistant, fine grain steel 22NiMoCr4-7 according to SEW 365, 366, 20MnMoNi5-5 and G18NiMoCr3-7.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Gas |
|------|-----|-----|------|------|-----|
| 0,03 | 0,7 | 1,4 | 22,8 | 12,5 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -60 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|-------------------------------|
| AW | M21 | 380 | 400 | 540 | 35 | 47 32 |

Structure

Austenite with part ferrite

Welding position



Polarity = +

Shielding gas (EN 439) M21 und C1,

Consumption: 15 - 20 l/min.

Approvals

TÜV (Certificate No. 7540)
DB (Certificate No. 43.132.14)

Germanischer Lloyd
Controlas

UDT

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 0,9 | B 300 | 12,5 | 100-180 | 18-29 |
| 1,2 | B 300 | 15 | 120-280 | 20-30 |
| 1,6 | B 300 | 15 | 180-350 | 22-32 |

Thermanit TG 309 Mo L

Classification

EN 12073

AWS A 5.22

Material No.

T 23 12 2 LRM3
T 23 12 2 LRC3

E309LMoT0-4
E309LMoT0-1

1.4459

Characteristics and field of use

Thyssen TG 309 Mo L is an austenitic CrNiMo flux cored wire with rutile slag characteristic. It is suited for GMAW welding with mixed gas M21 and C1 (acc. to EN 439). It is appropriate for joint welding high alloyed CrNi(Mo, N) steels/cast steel grades with unalloyed/low alloyed steels (austenite ferrite joints) with a maximum application temperature of 300 °C (572 °F). It is also suited for joint welding of high alloyed CrNi(Mo, N) steels/cast steel grades with stainless and heat resistant Cr steels/cast steel grades. For intermediate layers when welding the clad side of plates and cast materials clad with non stabilized and stabilized CrNi(Mo, N) austenitic metal. In the whole field of application this flux cored wire provides high resistance to hot cracking even at high degree of dilution.

The content of molybdenum provides a better corrosion resistance and simultaneously increases the ductility of austenitic joining combinations at higher temperatures. Weldable almost spatter free and due to the very slow freezing slag the weld metal shows fine and smooth weld pattern.

Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle. Root welding is proved on ceramic backing bar.

Materials

Combinations between X10CrNiMoNb18-12 (1.4583), X5CrNi18-10 (1.4301), GX6CrNi18-9 (1.4308), X2CrNiMo17-13-2 (1.4404), X2CrNiMo18-14 (1.4435), X6CrNiTi18-10 (1.4541), GX5CrNiNb18-9 (1.4552), X6CrNiMoTi17-12-2 (1.4571), X6CrNiMoNb17-12-2 (1.4580), X6CrNi18-11 (1.4948), X2CrNiMoN17-13-3 (1.4429), X2CrNi18-10 (1.4311), X2CrNiMoN17-12-2 (1.4406) and ferritic steels P265GH - P295GH, S255N - S355N; shipbuilding steels grade A - E, AH32 - EH36; A40 - F40.

For combinations of the following or joining of high strength, mild, and alloyed steels and temper steel grades, or heat resistant steels and Cr, CrNi or CrNiMo steel grades.

Ferritic austenitic joints in steam and pressure vessel constructions.

Cladding: First layer (buttering) in chemical resistant cladding on P235GH, P265GH, S255N, P295GH, S355N-S500N. Also first layer in corrosion resistant cladding and heat resistant tempered fine grain steels according to AD HP0, group 3.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Gas |
|------|-----|-----|------|-----|------|-----|
| 0,03 | 0,6 | 1,4 | 22,7 | 2,7 | 12,3 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -60 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|-------------------------------|
| AW | M21 | 500 | 550 | 700 | 35 | 47 32 |

Structure

Austenite with part ferrite

Welding position



Polarity= +

Shielding gas (EN 439) M21 und C1,

Consumption: 15 - 20 l/min.

Approvals

TÜV (Certificate No. 7688)
DB (Certificate No. 43.132.17)

ABS
Controlas

DNV
Germanischer Lloyd

Lloyd's Register
UDT

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 0,9 | B 300 | 12,5 | 100-180 | 18-29 |
| 1,2 | B 300 | 15 | 120-280 | 20-30 |
| 1,6 | B 300 | 15 | 180-350 | 22-32 |

Thermanit TG 316 L

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|----------------------------------|------------------------|--------------|
| T 19 12 3 LRM3 T 19 12 3 LRC3 | E316LT0-4 E316LT0-1 | 1.4430 |

Characteristics and field of use

Thermanit TG 316 L is an austenitic CrNiMo flux cored wire with rutile slag characteristic. It is suited for GMAW welding with mixed gas M21 and C1 (acc. to EN 439) for joining of matching and similar, non stabilized and stabilized, corrosion resistant CrNi(N) and CrNiMo(N) steels/cast steel grades. The weld metal is stainless and resistant to intercrystalline corrosion (wet corrosion up to 400 °C / 752 °F), cold tough up to -120 °C (-184 °F) and resistant to scaling up to 800 °C (1472 °F). Thermanit TG 316 L provides almost spatter free welding behaviour and due to the slow freezing rutile slag, the weld metal shows very fine and smooth weld pattern. Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle. Root welding is proved on ceramic backing bar.

Materials

X5CrNi18-10 (1.4301), X2CrNi19-11 (1.4306), GX6CrNi18-9 (1.4308), X5CrNiMo17-12-2 (1.4401), X2CrNiMo17-13-2 (1.4404), GX6CrNiMo18-10 (1.4408), X2CrNiMo18-14 (1.4435), X5CrNiMo17-13-3 (1.4436), X6CrNiTi18-10 (1.4541), X6CrNiNb18-10 (1.4550), GX5CrNiNb18-9 (1.4552), X6CrNiMoTi17-12-2 (1.4571), X10CrNiMoTi18-12 (1.4573), X6CrNiMoNb17-12-2 (1.4580), GXCrNiMoNb18-10 (1.4581), X6CrNi18-11 (1.4948); UNS S31653; AISI 316L, 316Ti, 316Cb.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Gas |
|------|-----|-----|------|-----|------|-----|
| 0,03 | 0,7 | 1,5 | 19,0 | 2,7 | 12,0 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -120 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------|
| AW | M21 | 350 | 400 | 560 | 35 | 47 32 |

Structure

Austenite with part ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 und C1,
Consumption: 15 - 20 l/min.

Approvals

| | | |
|--|---------------------------------|-----|
| TÜV (Certificate No. 7539) DB (Certificate No. 43.132.16) | Germanischer Lloyd Controlas | UDT |
|--|---------------------------------|-----|

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 0,9 | B 300 | 12,5 | 100-180 | 18-29 |
| 1,2 | B 300 | 15 | 120-280 | 20-30 |
| 1,6 | B 300 | 15 | 180-350 | 22-32 |

Thermanit TG 317 L

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|----------------|-----------|--------------|
| T 19 13 4 LRM3 | E317LT0-4 | ≈1.4440 |

Characteristics and field of use

Thermanit TG 317L is an austenitic CrNiMo flux cored wire with rutile slag characteristic. It is suitable for GMAW welding with mixed gas M21 (acc. to EN 439) for joining of matching and similar, non-stabilized and stabilized, corrosion resistant stainless steels/cast steels with 3 % molybdenum. High Mo-content provides elevated resistance to Cl-bearing environment and pitting corrosion. Thermanit TG 317L provides almost spatter free welding behaviour and due to the slow freezing rutile slag, the weld metal shows very fine and smooth weld pattern. Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle. Root welding is proved on ceramic backing bar.

Materials

CrNiMo-steels with higher Mo-content of type AISi 317L and resp. corrosion resistant claddings on unalloyed steel grades.
 1.4435 X2CrNiMo18-14-3, 1.4429 X2CrNiMoN17-11-2,
 1.4438 X2CrNiMo18-15-4; AISi 316L, 317LN

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | Gas |
|------|-----|-----|------|------|-----|-----|
| 0,03 | 0,7 | 1,2 | 19,9 | 12,5 | 3,4 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -60 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|-------------------------------|
| AW | M21 | 490 | 520 | 680 | 30 | 47 32 |

Welding position



Polarity = +
Shielding gas (EN 439) M21,
Consumption: 15 - 18 l/min.

Approvals

upon request

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 125-280 | 20-34 |

Thermanit TG 347

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|--------------------------------|----------------------|--------------|
| T 19 9 Nb RM3 T 19 9 Nb RC3 | E347T0-4 E347T0-1 | 1.4551 |

Characteristics and field of use

Thermanit TG 347 is an austenitic stabilized CrNi-Nb flux cored wire with rutile slag characteristic. This flux-cored wire finds applications in all branches of industry where matching steels as well as ferrite 13 % chromium steels are in use. Typical fields are the chemical apparatus engineering and tank construction, the textile and cellulose industry, dye-works enterprises etc. The simple handling of the flux cored wire leads to a high productivity with finely rippled weld pattern, with good side fusion and evenly safe penetration. The weld metal is cold tough up to -120 °C (-184 °F) and resistant to inter-crystalline corrosion and wet corrosion up to 400 °C (752 °F). Corrosion re-sistant similar to matching low-carbon and stabilized 18/8 CrNi(N) steels/cast steel grades. For joining and surfacing applications on matching and similar-stabilized and non-stabilized CrNi(N) steels/cast steel grades. For joining work on steel clad products and for weld cladding on unalloyed/low-alloyed (creep-resistant) steels/cast steel grades: mostly for second layer (cap pass) on higher-alloyed intermediate layer. Root welding is proved on ceramic backing bar.

Materials

1.4550 X6CrNiNb18-10, 1.4541 X6CrNiTi18-10,
1.4552 GX5CrNiNb18-10, 1.4301 X5CrNi18-10,
1.4312 GX10CrNi18-8, 1.4546 X5CrNiNb18-10,
1.4311 X2CrNi18-10, 1.4306 X2CrNi19-11,
AISI 347, 321, 302, 304, 304L, 304LN, ASTM A295 Gr. CF 8 C,
A157 Gr. C 9, A320 Gr. BBC oder D

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Gas |
|------|-----|-----|------|------|-------|-----|
| 0,03 | 0,7 | 1,5 | 19,7 | 10,2 | >12XC | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -120 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------|
| AW | M21 | 420 | 450 | 600 | 35 | 47 32 |

Welding position



Polarity = +
Shielding gas (EN 439) M21,
Consumption: 15 - 18 l/min.

Approvals

upon request

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 125-280 | 20-34 |

Thermanit TG 22/09

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|------------------------------------|--------------------------|--------------|
| T 22 9 3 N LRM3 T 22 9 3 N LRC3 | E2209LT0-4 E2209LT0-I | 1.4462 |

Characteristics and field of use

Thermanit TG 22/09 is an austenitic-ferritic CrNiMo flux cored wire with rutile slag characteristic. It is suited for GMAW welding of duplex steels with mixed gas M21 and CI (acc. to EN 439). It is appropriate for joining and surfacing (cladding) applications on matching and similar austenitic/ferritic steels/cast steel grades. The weld metal is resistant to intercrystalline corrosion (wet corrosion up to 250 °C (482 °F)) and provides a good resistance to pitting corrosion and stress corrosion cracking in chloride bearing environment. Suitable for use in chemical apparatus and plant construction, in chemical tank and general construction and on/offshore industry.

The flux cored wire is also suited for mixed structures of different steels („black/white“) with high resistance to hot cracking. Thermanit TG 22/09 provides almost spatter free welding behaviour and due to the very slow freezing rutile slag, the weld metal shows very fine and smooth weld pattern. Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle.

Root welding is proved on ceramic backing bar.

Materials

X2CrNiMoN22-5-3 (1.4462), GX6CrNiMo24-8-2 (1.4463), X2CrNiMoSi19-5 (1.4417), and similar alloyed ferritic-austenitic materials with higher strength and combinations between mentioned steels and ferritic steels such as P235GH - P295GH, S255N - S355N, 16Mo3, shipbuilding steels grade A - E, AH32 - EH36, A40 - F40 and steels corresponding to X10CrNiMoTi18-12 (1.4583). UNS S31803, S32205.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | N | Gas |
|------|-----|-----|------|-----|-----|------|-----|
| 0,03 | 0,8 | 0,9 | 22,7 | 3,2 | 9,0 | 0,13 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT, Shielding gas: M21)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -20 °C -40 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------------|
| AW | M21 | 600 | 650 | 800 | 25 | 60 50 32 |

Structure

Austenite / Ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 und CI,
Consumption: 15 - 18 l/min.

Approvals

| | | |
|-----------------------------------|---------------------------|-------------------------|
| TÜV (Certificate No. 7656) ABS | DNV Germanischer Lloyd | Lloyd's Register UDT |
|-----------------------------------|---------------------------|-------------------------|

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 130-220 | 22-30 |

Positional welding is demanding and commands specific properties of the welding consumable. For this complex field **T-PUT PW-series flux wires** are tailor made.

The products with their fast freezing, supporting slag are specially developed for this purpose.



- Suitable for all welding positions
- High deposition rate
- Easy slag removal

Thermanit 308 L-PW

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|----------------------------|------------------------|--------------|
| T 19 9 LPMI T 19 9 LPCI | E308LTI-4 E308LTI-1 | 1.4316 |

Characteristics and field of use

Thermanit 308 L-PW is an austenitic CrNi flux cored wire with rutile fast freezing slag. It is suited for GMAW welding with mixed gas M21 and 100 % CP2 in all positions, on matching and similar, non stabilized and stabilized, corrosion resistant CrNi(N) steels/cast steel grades.

The weld metal is stainless and provides good resistance to nitric acid, resistance to intercrystalline corrosion – wet corrosion up to 350 °C (662 °F), cold toughness up to -196 °C (-320 °F) and resistance to scaling up to 800 °C (1472 °F).

Thermanit 308 L-PW provides very fine and smooth weld pattern and almost spatter free welding behaviour. Very good slag detachability and notch free, clean seams with low annealing colouring, easy to clean and pickle.

Root welding is proved on ceramic backing bar.

Materials

X5CrNi18-10 (1.4301), X2CrNi19-11 (1.4306), GX6CrNi18-9 (1.4308), X2CrNi18-10 (1.4311), X6CrNiTi18-10 (1.4541), X6CrNiNb18-10 (1.4550), GX5CrNiNb18-9 (1.4552), X6CrNi18-11 (1.4948) and also covered materials acc. to VdTÜV-Kennblatt 1000.26; AISI 304, 304L, 304LN, 302, 321, 347; ASTM A157 Gr. C9; A320 Gr. B8C or D.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Gas |
|------|-----|-----|------|------|-----|
| 0,03 | 0,7 | 1,5 | 19,8 | 10,2 | M21 |

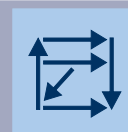
Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -196 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------|
| AW | M21 | 350 | 380 | 560 | 35 | 70 32 |

Structure

Austenite with part ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 und CI,
Consumption: 15 - 20 l/min.

Approvals

TÜV (Certificate No. 9770) DB (Certificate No. 43.132.23) UDT

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 120-250 | 22-28 |

Thermanit 309 L-PW

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|------------------------------|------------------------|--------------|
| T 23 12 LPMI T 23 12 LPCI | E309LT1-4 E309LT1-1 | 1.4332 |

Characteristics and field of use

Thermanit 309 L-PW is an austenitic CrNi flux cored wire with rutile, fast freezing slag. It is suited for all-position GMAW welding with mixed gas M21 and CI. It is appropriate for joint welding of high alloyed CrNi(Mo) steels/cast steel grades with unalloyed/low alloyed steels (austenite ferrite joints) with a maximum application temperature of 300 °C (572 °F). For joint welding of high alloyed CrNi(Mo, N) steels/cast steel grades with stainless and heat resistant Cr steels/cast steel grades.

For intermediate layers when welding the clad side of plates and cast materials clad with non stabilized and stabilized CrNi(Mo, N) austenitic metals. The weld metal is stainless (wet corrosion up to 300 °C / 572 °F).

Thermanit 309 L-PW provides very fine and smooth weld pattern and almost spatter free welding behaviour. Very good slag detachability and notch free, clean seams with low annealing colouring, easy to clean and pickle.

Root welding is proved on ceramic backing bar.

Materials

Combinations between X5CrNi18-10 (1.4301), X2CrNi19-11 (1.4306), GX6CrNi18-9 (1.4308), X5CrNiMo17-12-2 (1.4401), X2CrNiMo17-13-2 (1.4404), GX6CrNiMo (1.4408), X2CrNiMo18-14-3 (1.4435), X5CrNiMo17-13-3 (1.4436), X6CrNiTi18-10 (1.4541), X6CrNiNb18-10 (1.4550), GX5CrNiNb18-9 (1.4552), X6CrNiMoTi17-12-2 (1.4571), X6CrNiMoNb17-12-2 (1.4580), GXCrNiMoNb18-10 (1.4581), X10CrNiMoNb18-12 (1.4583), X6CrNi18-11 (1.4948) or combinations between austenitic and heat resistant steels such as X10CrAl7 (1.4713), X10CrAl13 (1.4724), X10CrAl18 (1.4742), GX40CrNiSi22-9 (1.4826), X15CrNiSi20-12 (1.4828), GX25CrNiSi20-14 (1.4832), GX40CrNiSi25-12 (1.4837)

with ferritic steels up to pressure boiler steel P295GH as well as fine grained structural steel up to P355N, shipbuilding steels grade A - E, AH 32 - EH 36, A40-F40.

Joinings of and between high-tensile, unalloyed and alloyed quenched and tempered steels, stainless, ferritic Cr and austenitic Cr-Ni steels, high manganese steels as well as claddings: for the first layer of chemical resistant weld claddings on ferritic-pearlitic steels up to fine grained structural steels S500N, in steam boiler and pressure boiler construction, as well as creep resistant fine grained structural steels 22NiMoCr4-7 acc. to leaflet „SEW-Werkstoffblatt“ No. 365, 366, 20MnMoNi5-5 and G18NiMoCr3-7.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Gas |
|------|-----|-----|------|------|-----|
| 0,03 | 0,7 | 1,4 | 22,8 | 12,5 | M21 |

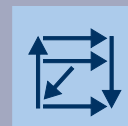
Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -60 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|-------------------------------|
| AW | M21 | 380 | 400 | 540 | 35 | 65 32 |

Structure

Austenite with part ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 und CI,
Consumption: 15 - 18 l/min.

Approvals

TÜV (Certificate No. 9772) DB (Certificate No. 43.132.22) UDT

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 120-250 | 22-28 |

Thermanit 309 Mo L-PW

Classification

EN 12073

T 23 12 2 LPMI
T 23 12 2 LPCI

AWS A 5.22

E309LMoTi-4
E309LMoTi-1

Material No.

1.4459

Characteristics and field of use

Thermanit 309 Mo L-PW is an austenitic CrNiMo flux cored wire with rutile fast freezing slag. It is suitable for GMAW welding with mixed gas M21 and C1 (acc. to EN 439). It is appropriate for joint welding high alloyed CrNi(Mo, N) steels/cas steel grades with unalloyed/low alloyed steels (austenite ferrite joints) with a maximum temperature of 300 °C (572 °F). It is also suited for service welding of high alloyed stainless steels/cas steel grades.

For intermediate layers when welding the clad side of plates and cast materials clad with non stabilized and stabilized CrNi(Mo, N) austenitic steels. This flux cored wire provides high resistance to hot cracking even at high dilutions. The content of molybdenum provides a better corrosion resistance and simultaneously increases the ductility of austenitic joining combinations of higher temperatures. Very good slag detachability and notch free seams with low annealing colouring, easy to clean and pickle. Root welding is proved on ceramic backing bar.

Materials

Joinings and combinations between austenitic steels like: X5CrNi18-10 (1.4301), X2CrNi19-11 (1.4306), GX6CrNi18-9 (1.4308), X5CrNiMo17-12-2 (1.4401), X2CrNiMo17-13-2 (1.4404), GX6CrNiMo (1.4408), X2CrNiMo18-14-3 (1.4435), X5CrNiMo17-13-3 (1.4436), X6CrNiTi18-10 (1.4541), X6CrNiNb18-10 (1.4550), GX5CrNiNb18-9 (1.4552), X6CrNiMoTi17-12-2 (1.4571), X6CrNiMoNb17-12-2 (1.4580), GXCrNiMoNb18-10 (1.4581), X10CrNiMoNb18-12 (1.4583), X6CrNi18-11 (1.4948)

or combinations between austenitic and heat resistant steels X10CrAl7 (1.4713), X10CrAl13 (1.4724), X10CrAl18 (1.4742), GX40CrNiSi22-9 (1.4826), X15CrNiSi20-12 (1.4828), GX25CrNiSi20-14 (1.4832), GX40CrNiSi25-12 (1.4837)

with ferritic steels up to P295GH as well as fine grained steels up to P355N and shipbuilding steels grade A - E, AH 32 - EH 36, A40 - F40.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | Gas |
|------|-----|-----|------|------|-----|-----|
| 0,03 | 0,7 | 1,4 | 22,7 | 12,5 | 2,8 | M21 |

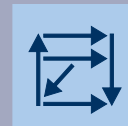
Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -60 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|-------------------------------|
| AW | M21 | 530 | 580 | 720 | 32 | 47 32 |

Structure

Austenite with part ferrite

Welding position



Polarity = +

Shielding gas (EN 439) M21 und C1,

Consumption: 15 - 18 l/min.

Approvals

TÜV (Certificate No. 9773)

UDT

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 120-250 | 22-28 |

Thermanit 316 L-PW

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|----------------------------------|------------------------|--------------|
| T 19 12 3 LPMI T 19 12 3 LPCI | E316LTI-4 E316LTI-1 | 1.4430 |

Characteristics and field of use

Thermanit 316 L-PW is an austenitic CrNiMo flux cored wire with rutile, fast freezing slag. It is suited for all position GMAW welding with mixed gas M21 and CI for joining of matching and similar, non stabilized and stabilized corrosion resistant CrNi(N) and CrNiMo(N) steels/cast steel grades. The weld metal is stainless, resistant to intercrystalline corrosion (wet corrosion up to 400 °C / 752 °F), cold tough up to -60 °C (-76 °F) and resistant to scaling up to 800 °C (1472 °F).

Thermanit 316 L-PW shows very fine and smooth weld pattern and almost spatter free welding behaviour. Very good slag detachability and notch free and clean seams with low annealing colouring, easy to clean and pickle.

Root welding is proved on ceramic backing bar.

Materials

X5CrNi18-10 (1.4301), X2CrNi19-11 (1.4306), GX6CrNi18-9 (1.4308), X5CrNiMo17-12-2 (1.4401), X2CrNiMo17-13-2 (1.4404), GX6CrNiMo18-10 (1.4408), X2CrNiMo18-14 (1.4435), X5CrNiMo17-13-3 (1.4436), X6CrNiTi18-10 (1.4541), X6CrNiNb18-10 (1.4550), GX5CrNiNb18-9 (1.4552), X10CrNiMoNb18-12 (1.4583), X6CrNiMoTi17-12-2 (1.4571), X10CrNiMoTi18-12 (1.4573), X6CrNiMoNb17-12-2 (1.4580), GXCrNiMoNb18-10 (1.4581), X6CrNi18-11 (1.4948) and also covered materials acc. to VdTÜV 1000.26. UNS S31653; AISI 316L, 316Ti, 316Cb.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Gas |
|-------|-----|-----|------|-----|------|-----|
| 0,030 | 0,7 | 1,4 | 19,0 | 2,7 | 12,0 | M21 |

Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT, Shielding gas: M21)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -120 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------|
| AW | M21 | 350 | 400 | 560 | 38 | 65 32 |

Structure

Austenite with part ferrite

Welding position



Polarity = +
Shielding gas (EN 439) M21 und CI,
Consumption: 15 - 18 l/min.

Approvals

TÜV (Certificate No. 9771) DB (Certificate No. 43.132.24) UDT

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 120-250 | 22-28 |

Thermanit 22/09 PW

Classification

| EN 12073 | AWSA 5.22 | Material No. |
|------------------------------------|--------------------------|--------------|
| T 22 9 3 N LPMI T 22 9 3 N LPCI | E2209LT1-4 E2209LT1-1 | 1.4462 |

Characteristics and field of use

Thermanit 22/09 PW is an austenitic-ferritic CrNiMo flux cored wire with rutile slag characteristic. It is suited for GMAW welding of duplex steels with mixed gas M21 and C1 (acc. to EN 439). It is appropriate for joining and surfacing (cladding) applications on matching and similar austenitic/ferritic steels/cast steel grades. The weld metal is resistant to intercrystalline corrosion (wet corrosion up to 250 °C / 482 °F) and provides a good resistance to pitting corrosion and stress corrosion cracking in chloride bearing environment. Suitable for use in chemical apparatus and plant construction, in chemical tank and general construction and on/offshore industry. The flux cored wire is also suited for mixed structures of different steels („black/white“) with high resistance to hot cracking.

The supporting effect of the fast solidifying rutile slag to the weld pool of this flux cored wire allows, especially when out of position welding, higher welding performance (deposition rate) in comparison to stick electrodes or solid wire.

Root welding is proved on ceramic backing bar.

Materials

X2CrNiMoN22-5-3 (1.4462), GX6CrNiMo24-8-2 (1.4463), X2CrNiMoSi19-5 (1.4417), X2CrNiN23-4 (1.4362) and similar alloyed ferritic-austenitic materials with higher strength and combinations between mentioned steels and ferritic steels such as P235GH - P295GH, S255N - S355N, 16Mo3, shipbuilding steels grade A - E, AH32 - EH36; A40-F40 and steels corresponding to X10CrNiMoTi18-12 (1.4583)

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | N | Gas |
|------|-----|-----|------|-----|-----|------|-----|
| 0,03 | 0,7 | 1,0 | 22,7 | 3,2 | 9,0 | 0,13 | M21 |


Mechanical properties of the weld metal acc. to EN 1597-1 (min. values at RT, Shielding gas: M21)

| Heat Treatment | Gas | Yield strength 0.2% N/mm ² | Yield strength 1.0% N/mm ² | Tensile strength N/mm ² | Elongation (L ₀ =5d ₀) % | Impact values in J CVN -20 °C -40 °C |
|----------------|-----|---------------------------------------|---------------------------------------|------------------------------------|---|--------------------------------------|
| AW | M21 | 600 | 650 | 800 | 25 | 60 45 32 |

Structure

Austenite / Ferrite

Welding position



Polarity = +

Shielding gas (EN 439) M21 und C1,

Consumption: 15 - 18 l/min.

Approvals

| | | |
|-----------------------------------|---------------------------|-------------------------|
| TÜV (Certificate No. 9106) ABS | DNV Germanischer Lloyd | Lloyd's Register UDT |
|-----------------------------------|---------------------------|-------------------------|

Packaging, weights and amperages

| Dimensions (mm) | Spool | Weight (kg) | Amperage | Volts |
|-----------------|-------|-------------|----------|-------|
| 1,2 | B 300 | 15 | 130-220 | 22-30 |

References

Apparatebau Stahl (Germany)

BEFU Umwelttechnik (Germany)

Butting (Germany)

Dehoust (Germany)

Deller (Germany)

Eferest (Germany)

Graaf Transportsysteme (Germany)

HDW (Germany)

Infracor (Germany)

Koopmeiners Klärtechnik (Germany)

Ley GmbH (Germany)

Linde (Germany)

Pilling (Germany)

PRG Präzisions Rührer (Germany)

Rudert (Germany)

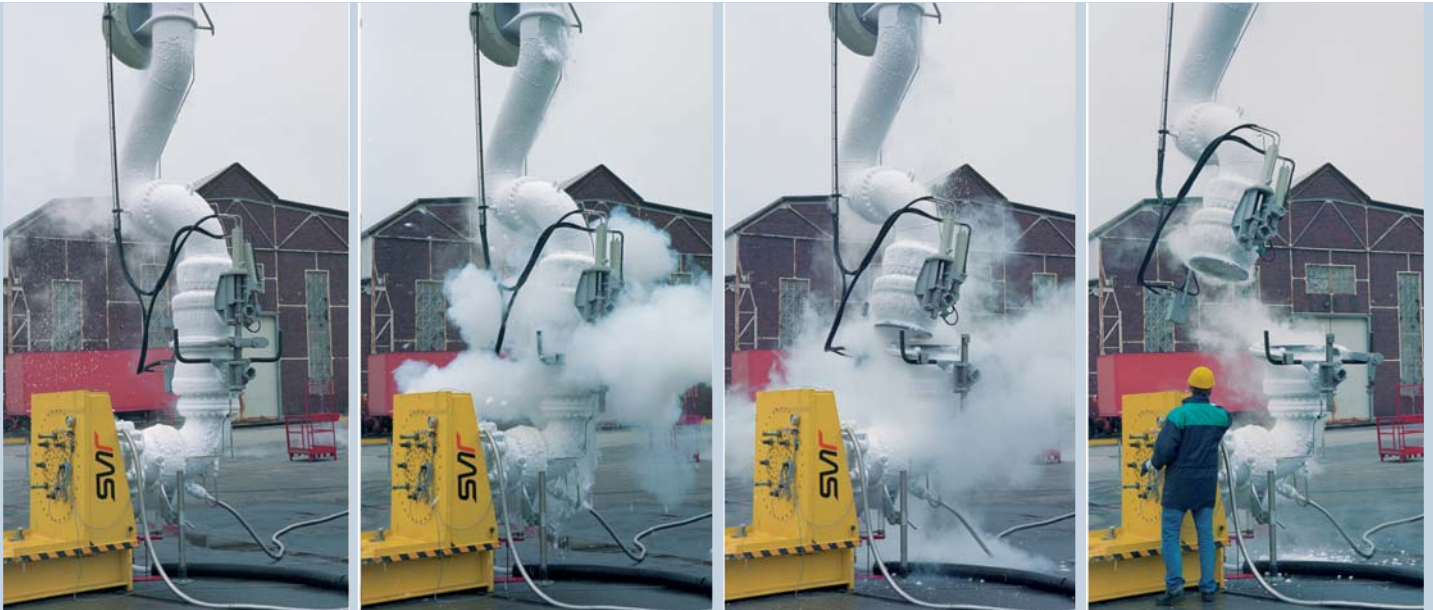
Sietas (Germany)

SVT GmbH (Germany)

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Walter Ludwig (Germany)

Westfalia Separator (Germany)



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